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ORIGINAL ARTICLE

Cardiac Surgery during COVID-19 Pandemic: Preliminary Results and Insights.

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ABSTRACT

Background: Elective cardiac surgical operations were resumed after a period of decline of infection rate of COVID-19 pandemic. Guidelines and recommendations are formulated for safe resumption. The aim of this study was to present our experience of reopening of cardiac surgical activities.

Methods: A double-centred prospective longitudinal study was performed in cardiac surgery departments at Zagazig University hospitals and Nasser Institute starting from 1st July to 15th September. COVID PCR swab and CT chest were done for all patients and positive cases were postponed. Safety measures were strictly followed. We applied a strategy for patient selection and recruitment of medical staff for surgical activities.

Results: Sixteen patients were positive for COVID-19 and not admitted. We operated 177 patients (165 elective, 12 emergent). Two patients were found positive postoperatively and died from pulmonary complications. One surgeon was infected and survived.

Conclusions: Preliminary results of resuming cardiac surgical activities were encouraging. Strict adherence to preventive measures and adopting appropriate strategy for patient selection are crucial for safety of patients and health care givers.

Key words: COVID-19, surgical resumption, reopen surgical activities

INTRODUCTION

When the viral infectivity exceeded the containment efforts and exhausted the resources, there was a definite need for lock down period. The preventive approach of the mitigation period minimized the use of cardiac surgeons and co-workers only to face emergency cases and defer elective cases.

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus has a serious impact on health care facilities. Elective cardiac surgical procedures were postponed for a period of about 6 months. After a period of decline in the incidence of infection, there was a pressing need to resume elective surgical procedures in the (re-open) era. Strategies are crucial to achieve this aim safely without adding risks to patients and healthcare professionals (1).

Because of the limited available data on cardiac surgery patients during the outbreak of COVID-19 pandemic worldwide, we felt the urgency to share our modest experience. This is retrospective observational cohort study. Our primary objective was to examine early surgical mortality in cardiac surgery patients during reopening phase of COVID-19. The secondary objective included the lessons learnt and insights polarized to help safe return of cardiac surgery during the reopening period.

METHODS

Study design and study participants

This is a double-centered retrospective longitudinal study that was performed in cardiac surgery departments at Zagazig University hospitals and Nasser Institute, Cairo.

A comprehensive sample was taken over the duration of the study (starting from 1st July to 15th September). Subjects included in the study were patients who were candidates for cardiac surgery and the medical team who participated in the operating team. Exclusion criteria included patients and medical staff currently or previously infected with COVID-19.

Operating design

Patients first attended to the outpatients for history taking and clinical evaluation. Patients planned to perform cardiac surgery were tested for COVID-19

infection and underwent CBC, serum Ferritin, COVID PCR swab and CT chest before admission to the hospital and those positive were postponed. Patients were retested after surgery depending on some red flags indicating reevaluation. Patients proven positive after surgery were isolated in the ICU in isolation beds. Figure (1) shows the algorithm for patient admission and follows up throughout cardiothoracic surgery reopening phase during corona pandemic.

COVID- PCR swab and CT chest were performed for medical team staff who had symptoms or a positive RAPID test at the beginning of the reopening stage. Positive patients were dismissed from the surgical team and quarantined. Figure (2) shows the algorithm for medical staff members recruitment for joining the operating team throughout cardiothoracic surgery reopening phase during COVID-19 pandemic.

Medical staff and Safety measures

Outpatient clinic:

All physicians and nurses working in the OR wore protective gloves, and surgical masks. Number of patients visiting the outpatient clinic had been reduced to avoid overcrowdings and medical team exposure to infection.

Intensive Care Unit (ICU) and ward:

All physicians and nurses working in the ICU wore protective gloves, surgical masks, and face shields. Sterilizers and antiseptics were placed beside each bed. An isolated section in the ICU was set up for infected cases after surgery under the supervision of the hospital infection control unit. All physicians and nurses managing these patients wore personal protective equipment (PPE). Ventilators and all equipment were sterilized according to infection control guidelines in the hospital.

Operating room (OR):

All physicians and nurses working in the OR wore protective gloves, and surgical masks. Anesthesiologists necessarily wore face shields especially at the time of intubation. Sterilization of the OR and operating tools was done in the usual manner.

Data collection and analysis

Patient data were collected from the outpatient clinics responsible for examining patients and admitting them to the hospital. Patients were followed up throughout the operating procedure and thereafter as previously described in the algorithms in figure 1 and figure 2.

Ethical considerations:

This study was approved by the institutional review board of Zagazig University (Zagazig University Institutional Review Board, [ZU-IRB#6321/16-8-2020)], in accordance with the code of ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans and an informed consent was taken from all patients. ***Ethical responsibility***: All of the authors have confirmed and signed on preservation, confidentiality and respect of patients' rights.

STATISTICAL ANALYSIS

Data was recorded, entered and analyzed using SPSS (Statistical Package for Social Science) version 22. Age was presented as mean and standard deviation. Responses were presented as number and percentages.

RESULTS

Patient admission and elective cases:

Throughout the period of the study, 193 patients came to our hospitals for cardiac surgery including 50 females and 143 males. Out of them 181 patients were elective cases and 12 were emergency cases. Patient characteristics are shown in table (1). COVID testing was done for elective cases which revealed 16 positive patients who were asymptomatic (8.8%) including 3 patients who had mild CT changes. These patients were not admitted to our hospitals, and 165 patients were admitted for elective cardiac surgery.

Dealing with emergency cases:

The twelve emergency cases (9 stuck valve, 2 Left main disease and 1 aortic dissection) who were admitted at once and COVID testing was postponed after the surgery, out of which 1 patient was positive for COVID 19.

COVID 19 cases and mortality:

Patients proven to have COVID 19 following surgery were isolated in an isolation ICU. Unfortunately, an elective patient underwent surgery in the same operating room -before the results of COVID testing of the emergency case was revealed- was infected and also one of the surgeons who followed up the patient postoperatively. Patients were isolated in an isolation ICU and the surgeon was quarantined at home and took medical treatment and was cured. The 2 patients died 7-10 days after surgery due to pulmonary complications representing only 1.13% of all 181 cases admitted (as shown in figure 3)

Table 1: Patients' characteristics

Patients undergoing cardiac surgery (*N*=177)			
	Non-infected (*N*=175)	**COVID infected (*N*=2)**	***p*-value**
Age			

Patients undergoing cardiac surgery (*N*=177)			
Mean ± SD	51.39 ± 11.7	49.5+0.5	0.00
Sex *N (%)* Female Male	 45 (25.4%) 130 (74.3%)	 0 (0%) 2 (100%)	 >0.9
Smoking *N (%)* Non-smokers Smokers	 150 (85.7%) 27 (15.3%)	 1 (50%) 1 (50%)	 0.6
Comorbidities Hypertension Diabetes mellitus	 81(46.3%) 62 (35.4%)	 1 (50%) 1 (50%)	 >0.9
Type of surgery Valve CABG Both Others	 70 (40%) 75 (42.9%) 18 (10.3%) 12 (6.9%)	 1 (50%) 1 (50%) 0 (0) 0 (0)	 0.9
Hospital stay < 1 week >1 week	 96 (54.9%) 79 (45.1%)	 0 (0) 2 (100%)	0.7
ICU stay < 2 days >2 days	 85 (48.6%) 90 (51.4%)	 0 (0) 2 (100%)	0.8

CABG: Coronary Artery Bypass Grafting, ICU: Intensive Care Unit

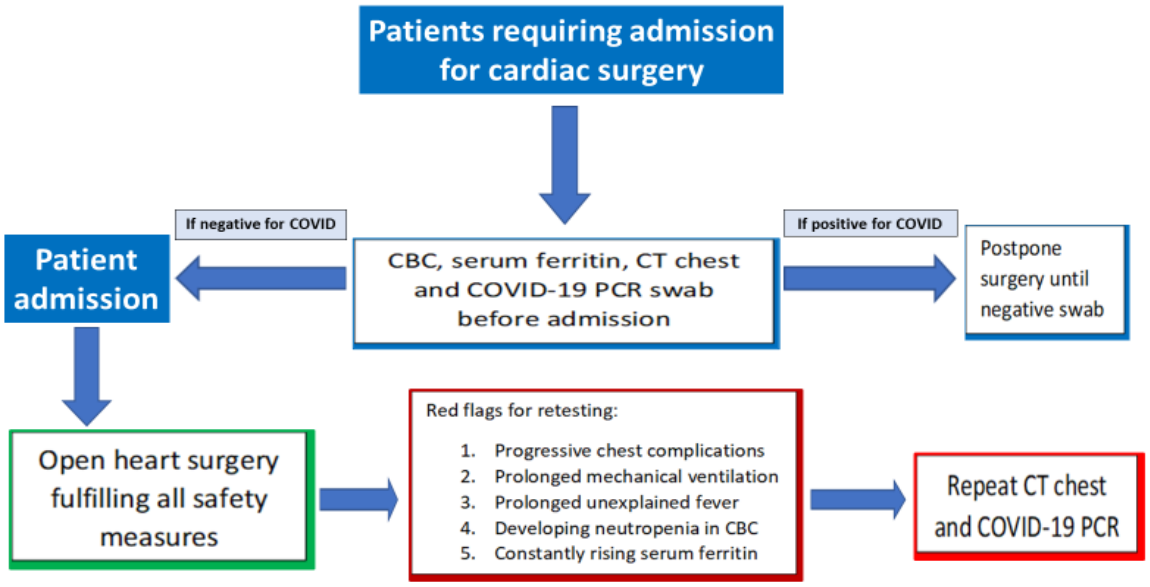

Figure (1): Algorithm showing strategy for patient admission and follow up throughout cardiothoracic surgery reopening phase during corona pandemic.

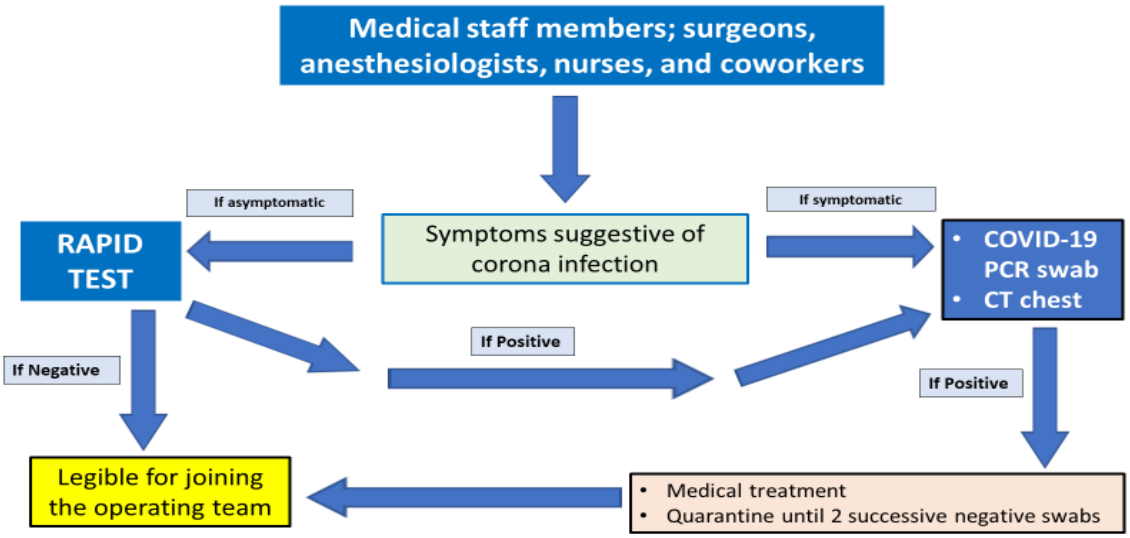

Figure (2): Algorithm showing strategy for medical staff members recruitment for joining the operating team throughout cardiothoracic surgery reopening phase during corona pandemic.

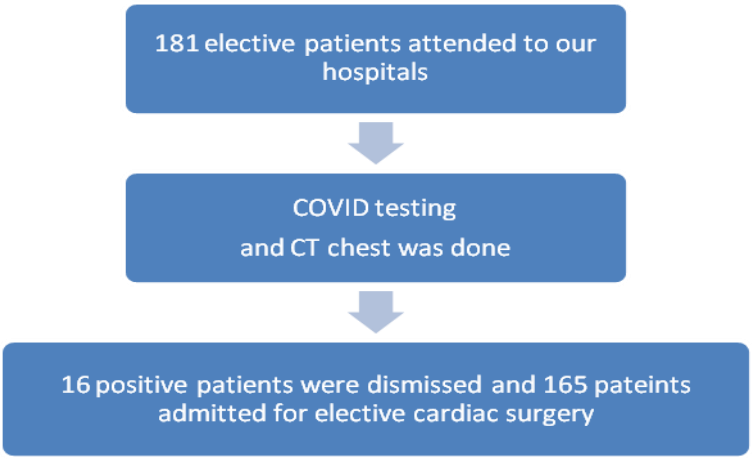

Figure 3: Elective cases admitted to our hospitals

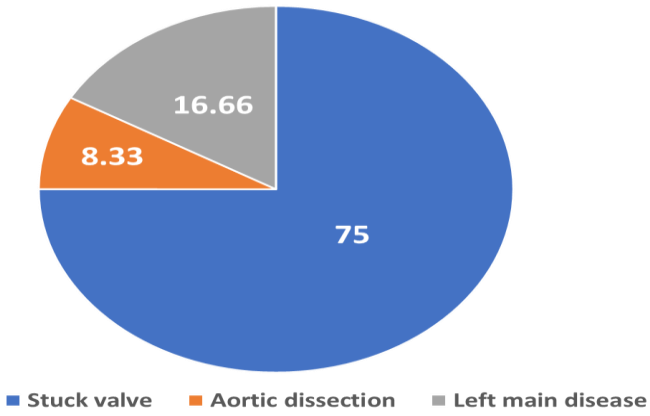

Figure 4: Percentages of different surgical emergencies who were not tested for COVID before admission

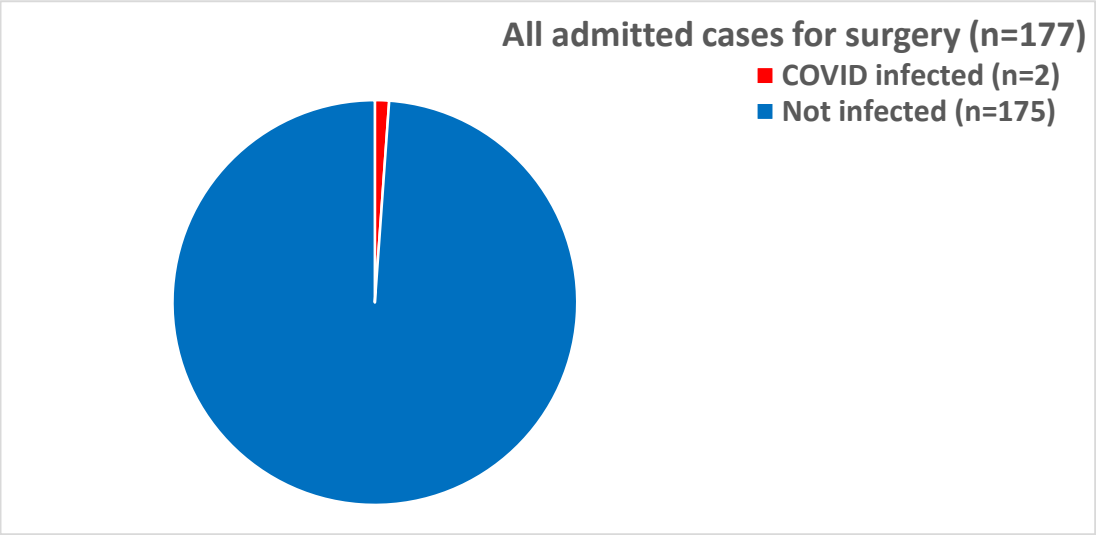

Figure 5: Number of infected patients with COVID after cardiac surgery.

DISCUSSION

Elective cardiac surgical operations were postponed in response to COVID-19 pandemic. It is still unknown if this outbreak is going to end, remerge, or other pathogens will appear. However, we should adapt with these circumstances and provide the best surgical care as well as protection for our patients and staff (2).

After decline of the first wave, there was an increasing demand to resume elective procedures.

Several guidelines and roadmaps were reported for resuming elective surgery. However, few reports could be found in literature presenting outcome of surgical resumption. We tried to share our experience with cardiac surgical reopening.

It is important to make sure that hospital resources and equipment's can sufficiently meet demands of elective surgical operations (3).

Needless to say that emergent and urgent operation has a priority. However, resuming elective cardiac operations is important for relieving suffering of patients and improving their quality of life. Factors considered in our prioritization policy included: severity of symptoms, risk factors, progression of the disease, comorbidities, and list of previously postponed or cancelled patients.

Preoperative testing for COVID-19 is mandatory. PCR-RT is preferred and should be done at a maximum of 72 hours before operation. If samples are not collected within this period, rapid molecular testing is recommended (4). Patients who are positive for testing should be cancelled since postoperative course for infected patients is worse with high mortality rate even if they are asymptomatic. In addition, health care providers and other patients are exposed to high risk of infection (5).

There is still ongoing debate about value and sensitivity of CT chest as a screening tool for preoperative patients (6). We ordered CT chest for all patients before admission. We believe that high sensitivity of CT is valuable in isolating suspicious cases. In addition, combination of chest CT-scan and PCR-RT has the highest diagnostic sensitivity (92%), compared to CT alone (67%) or PCR-RT alone (86%) (7)

Emergency cases are challenging. We operated 12 cases. PCR-RT was done for all of them postoperatively. A patient operated for obstructed mechanical valve proved to be positive for COVID-19. Unfortunately, another patient was operated electively in the same room and was infected. Both of them died as a result of pulmonary complications. It would be safer to consider emergent cases positive for COVID-19 and isolate them until the results are available. As a preventive measure; we assigned an ICU for emergency cases.

We adopted a preoperative checklist to revise all necessary investigations for COVID-19. Postoperatively we adhere to standardized protocols for safety and prevention of infection. Our strategy was effective in minimizing the risk of exposure to patients and caregivers. Apart from the 2 mortality cases, no other patients were infected during hospital stay.

Proper communication with patients and visitors are needed to educate them regarding COVID-19 testing, use of PPE, and post discharge care and follow up (8)

Seventy seven Egyptian cardiothoracic surgeons were included in cross-sectional survey (9) during the outbreak of COVID-19. Step-by-step re-start of elective procedures was recommended by 80% of them. Evaluation was advised before complete resumption of surgical activities (9). We follow this recommendation and started surgical activities in a gradual staged manner.

Our study has some limitations. It is a two center study. Multicenter study with larger number of patients is needed to formulate roadmap for the

whole country. Another limitation is that we did not test all patients postoperatively. Patients were screened for any symptoms of COVID-19 during hospital admission and 2 weeks after discharge and symptomatic patients were tested. We still cannot identify infected patients who were asymptomatic.
Our preliminary experience with reopening is a model that can be repeated in other cardiac surgical centers in Egypt. We recommend conducting a survey among cardiothoracic surgeons to share their experience and present challenges they are facing during attempt to resume surgical activities.

CONCLUSIONS

Preliminary results of resuming cardiac surgical activities were encouraging. Strict adherence to preventive measures and adopting appropriate strategy for patient selection are crucial for safety of patients and health care givers.

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